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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/525,903	09/06/2005	Junichiro Ichikawa	1716364	9664

7590 11/03/2006

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16th Floor
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EXAMINER

ANDERSON, GUY G

ART.UNIT	PAPER NUMBER
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2883

DATE MAILED: 11/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/525,903

Applicant(s)

ICHIKAWA ET AL.

Examiner

Guy G. Anderson

Art Unit

2883

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 February 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 2/2/2006.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

1.1 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1.2 **Claims 1-22 are rejected** under 35 U.S.C. 103(a) as being unpatentable over US-5627920 to Kato et al. in view of US-6480639 to Hashimoto et al.

Regarding Claims 1, 8, 12, 21, Kato specifically discloses an optical modulator comprising/wherein:

1a, 8a, 12a, 21a) a substrate comprised of a material having an electro-optic effect, an optical waveguide formed on said substrate, and a modulating electrode for allowing an electric field to work on said optical waveguide, and changing a phase of light passing through said optical waveguide. [Kato at Abstract, Fig. 1.]

Kato does not specifically teach an optical modulator comprising/wherein:

1b) stray light rejection means are provided on a surface of said substrate.

8b) a low refractive index area with a refractive index lower than that of said substrate is provided at one portion of adjacent spaces comprising at least a lower portion and a side portion of said optical waveguide in order to prevent stray light from entering the optical waveguide.

12b) a high refractive index area with a refractive index higher than a refractive index of said substrate is provided at a reverse face of said substrate.

21b) a high refractive index area with a refractive index higher than a refractive index of said substrate is provided at a side face of said substrate.

Hashimoto discloses an optical module that teaches the use of stray light rejection means including light blocking grooves on the cladding and substrate, metal doping in order to change the refractive index properties and thus absorb stray light, and a resin layer coating which provides another layer with a different refractive index in order to absorb stray light,

Art Unit: 2883

and placing light blocking regions in various areas of the module in order to absorb or scatter light. [Hashimoto at Col. 3-4, Lines 45-67, 1-25, Col. 13-14, Lines 45-67, 1-25, Col. 15-16, Lines 20-67, 1-10, Col. 16, Lines 10-42.]

Since Kato and Hashimoto are both from the same field of endeavor, the light rejection means of Hashimoto would have been recognized in the pertinent art of Kato.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the optical modulator of Kato with the light rejection means of Hashimoto in order to block and absorb stray light.

Regarding Claim 2, the combination of Kato and Hashimoto discloses all of the limitations of the base claim upon which Claim 2 depends.

Hashimoto discloses an optical module that teaches the use of stray light rejection means including:

2) said stray light rejection means comprises a stray light rejection groove, at least one part of which is formed adjacent to said optical waveguide. [Hashimoto at Col. 3-4, Lines 45-67, 1-25, Col. 13-14, Lines 45-67, 1-25, Col. 15-16, Lines 20-67, 1-10, Col. 16, Lines 10-42.]

Since Kato and Hashimoto are both from the same field of endeavor, the light rejection means of Hashimoto would have been recognized in the pertinent art of Kato.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the optical modulator of Kato with the light rejection means of Hashimoto adjacent to the waveguide.

Regarding Claims 3-5, the combination of Kato and Hashimoto discloses all of the limitations of the base claim upon which Claim 3-5 depends.

The combination does not specifically disclose a module comprising/wherein:

3) a distance between said stray light rejection groove and said optical waveguide is 10 to 100 μm at closest.

4) depth of said stray light rejection groove is almost the same as or is more than depth of said optical waveguide.

5) said stray light rejection groove is filled with a light absorbing material.

However, determining the optimum dimensions or working ranges has been held to require only routine skill in the art. In re Aller, 105 USPQ 233.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the optical modulator of Kato with the light rejection means of Hashimoto adjacent to the waveguide and to vary the distances between the grooves and waveguides as well as the depth of the grooves, and to add light absorbing material into the groove in order to better absorb various wavelengths of light.

Regarding Claims 6-7, the combination of Kato and Hashimoto discloses all of the limitations of the base claim upon which Claim 6-7 depends.

The combination does not specifically disclose a module comprising/wherein:

- 6) said optical waveguide comprises a branching optical waveguide, and at least one part of said stray light rejection means is provided adjacent to said branching optical waveguide.
- 7) at least one part of said stray light rejection means is provided between the optical waveguide upon which the electric-field of the modulating electrode works and a side face of the substrate that is close to said optical waveguide.

However, Kato discloses a MZ modulator with branching waveguides while Hashimoto discloses the stray light rejection means as listed above.

Since Hashimoto discloses a light-blocking groove near and adjacent to the waveguides in his invention, it would have been obvious to one of ordinary skill in the art at the time of invention to place a light blocking groove adjacent to one, both or in between the waveguides of the MZM in order to more effectively block stray light.

Regarding Claims 9-11, the combination of Kato and Hashimoto discloses all of the limitations of the base claim upon which Claim 9-11 depends.

The combination does not specifically disclose a module comprising/wherein:

- 9) said low refractive index area has a thickness greater than a depth of said optical waveguide in a thickness direction of the substrate from a surface of said substrate, and a refractive index between a deepest part of said low refractive index area and a reverse face of said substrate is higher than the refractive index of said low refractive index area.
- 10) said low refractive index area is formed by diffusion of a low refractive index material having a refractive index lower than that of said substrate, over said substrate.
- 11) said low refractive index area comprises MgO or ZnO as the low refractive index material.

Art Unit: 2883.

Hashimoto does disclose the use of materials with different refractive indexes as a means to absorb light as indicated above including a low refractive index resin coating. [Hashimoto at Col. 3-4, Lines 45-67, 1-25, Col. 13-14, Lines 45-67, 1-25, Col. 15-16, Lines 20-67, 1-10, Col. 16, Lines 10-42.]

However, determining the optimum dimensions or working ranges has been held to require only routine skill in the art. *In re Aller*, 105 USPQ 233.

Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select either MgO or ZnO as possible materials as it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Regarding Claims 13-15, 18-20, the combination of Kato and Hashimoto discloses all of the limitations of the base claim upon which Claim 13-15 depends.

The combination does not specifically disclose a module comprising/wherein:

13, 18) antireflection treatment is given on a reverse face or a side face of said substrate.

14, 19) the frequency of modulation drive is more than 40GHz.

15, 20) input power of light input into said optical modulator is more than 10mW.

Hashimoto specifically discloses the use of anti-reflection coatings as light blocking layers. [Col. 16, Lines 32-42.] It is also well known in the art that 40 Ghz is a current standard speed that manufactures of modulators must meet in order to have devices that are usable in today's telecom market. It is also well known in the art that 10mW and higher are standard power outputs of typical semiconductor lasers used in the art.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Kato with the light blocking means of Hashimoto while designing a device capable of operating at 40GHz and capable of handling input optical power greater than 10mW.

Regarding Claims 16-17, the combination of Kato and Hashimoto discloses all of the limitations of the base claim upon which Claim 16-17 depends.

The combination does not specifically disclose a module comprising/wherein:

Art Unit: 2883

16) depth of said stray light rejection groove is almost the same as or is more than depth of said optical waveguide.

17) said stray light rejection groove is filled with a light absorbing material.

However, determining the optimum dimensions or working ranges has been held to require only routine skill in the art. *In re Aller*, 105 USPQ 233.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the optical modulator of Kato with the light rejection means of Hashimoto adjacent to the waveguide and to vary the distances between the grooves and waveguides as well as the depth of the grooves, and to add light absorbing material into the groove in order to better absorb various wavelengths of light.

Regarding Claims 22, the combination of Kato and Hashimoto discloses all of the limitations of the base claim upon which Claim 22 depends.

The combination does not specifically disclose a module comprising/wherein:

22) a high refractive index area with a refractive index higher than a refractive index of said substrate also is provided at a reverse face of said substrate.

Hashimoto does disclose the use of materials with different refractive indexes as a means to absorb light as indicated above including a low refractive index resin coating. [Hashimoto at Col. 3-4, Lines 45-67, 1-25, Col. 13-14, Lines 45-67, 1-25, Col. 15-16, Lines 20-67, 1-10, Col. 16, Lines 10-42.]

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the high refractive index area at the rear face of the substrate in order to absorb back reflections.

Conclusion

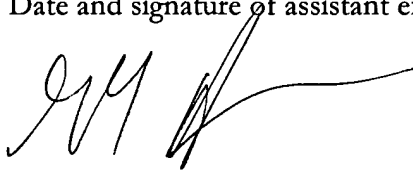
2.1 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Guy G. Anderson whose telephone number is 571.272.8045. The examiner can normally be reached on M-Th 1130-2200.

2.2 If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on 571.272.2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

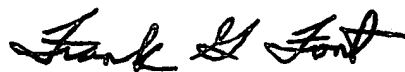
Art Unit: 2883

2.3 Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

2.4 Date and signature of assistant examiner.



October 24, 2006



Frank G. Font
Supervisory Patent Examiner
Technology Center 2800